CVP Cost Allocation Study Leadership Team Recommendation on Proposed Streamlined Short-Cut Method for Computing Power Benefits

Date

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Purpose of Paper

Recommendation on Proposed Streamlined Short-Cut Method for Computing Power Benefits for the Central Valley Project (CVP) Cost Allocation Study.

Background

Reclamation has had a policy and past practice whereby projects in construction status had major cost allocation study updates performed at 10 year intervals, with interim allocation updates performed every 5 years. The last major cost allocation study for the CVP was completed in 1970, and an interim update was completed in 1975. Although new legislation and new regulatory considerations, coupled with the construction of new facilities have significantly altered project accomplishments and operations in the intervening 38 years, Reclamation was unable to update the CVP cost allocation because of the cost, complexities and controversy associated with such an effort. In 2010, Reclamation committed to update the CVP cost allocation prior to the Folsom Safety of Dams project completion (anticipated in 2017) so that the distribution of those new facility costs will follow a more current allocation; since then Reclamation has secured appropriate funding and resources to support this new cost allocation study for the CVP.

First authorized in 1935, the CVP is a multipurpose project whose individual project features and/or elements (e.g., facilities and/or divisions) have been re-authorized at key legislative junctures to be financially and operationally integrated and operated as a single project. The CVP is authorized to serve the following 7 project purposes: Water Supply, Power, Flood Control, Recreation, Fish and Wildlife, Navigation, and Water Quality. This recommendation

paper addresses an issue related to a computational method and/or approach for calculating the power benefits associated with the multipurpose project.

Under the Principles and Guidelines, benefits are estimated from a National perspective rather than from the effects to a particular locality or regional standpoint. For power benefits, this means valuing the attributes of the CVP's hydro power accomplishments in terms of the benefits provided to the nation through the Western Interconnection's Bulk Electric System, or to California's electric grid, rather than valuing the benefits as part of the preference power customers' portfolios.

When comparing the benefits and costs for all project purposes, both inputs and outputs need to reflect (and maintain) the relative relationships of prices expected to prevail over the period of analysis. To avoid speculation regarding future price relationships, Reclamation uses the prices prevailing during, or immediately preceding, the period of analysis. In other words, benefits and costs for all purposes are valued at the same price level (2010, in this case) unless specific considerations to justify using a price that is different from (either higher or lower than) the existing price relationship. The next paragraph explains why the changing dynamics of California's electricity market make it imperative to value power benefits at a point in time when the changing market should have stabilized, i.e. by the year 2020. Year 2020 power benefit values will be indexed to the year 2010 values using appropriate compounding/discounting procedures.

Two acceptable approaches in valuing power benefits include: (1) alternative costs or (2) market prices. Under the alternative cost approach, power benefits are evaluated by estimating the cost of building and operating another power plant that provides a comparable level of benefits in terms of generation and ancillary services provided by the hydro power plant. Under the market price approach, use of recent historic market prices might be acceptable if the electric market were relatively static. However, California is currently implementing a 33% Renewable Portfolio Standard (RPS) and a Greenhouse Gas Emissions Reduction mandate, which means electricity market dynamics are undergoing a change in the price relationship currently existing for power. Given that much of the renewable generation to meet the 33% RPS mandate will come from non-dispatchable, intermittent resources such as wind and solar, the California Independent System Operator (CAISO) has publicly stated in a number of forums that the electricity market is undergoing a transformation to value certain attributes, such as flexible generation, more than other attributes.[1] Flexible generation can ramp up and own quickly to compensate for fluctuations in wind and solar generation to reliably meet load on a four-secondby-four-second basis. Hydropower is one of the best providers of such attributes as flexible generation, spinning reserves and other ancillary services, which are needed to allow the CAISO or other California balancing authorities, such as the Balancing Authority of Northern California

[1] In CAISO's *2012 Annual Report on Market Issues and Performance,* CAISO proposes " major changes to its realtime market" including to "replace the flexible ramping constraint with a flexible ramping product." This report is found at http://www.caiso.com/Documents/2012AnnualReport-MarketIssue-Performance.pdf

(BANC), to operate reliably to meet electrical load. BANC is a Joint Powers Authority comprised of a number of CVP preference power customers. CVP generation and Western Area Power Administration's transmission facilities along with the 500 kV California Oregon Transmission Project (COTP) are included among other resources within the BANC footprint.

Reclamation has contracted with Pinnacle Consulting LLC to perform power benefits analyses for a number of planning studies and the CVP Cost Allocation Study using the PLEXOS model. The PLEXOS model dynamically simulates the market dispatch of generation to meet load and reserve requirements while respecting transmission constraints to estimate the price of the resource being evaluated (in this case, the CVP hydropower system). PLEXOS is particularly good at modeling hourly hydro dispatch constrained by water operations and regulatory requirements. In addition, PLEXOS allows future benefits to be evaluated considering load growth, market dynamics and generation additions needed to meet legislative mandates.

Conceptually, when undertaking a benefit analysis to ensure that only the net benefits attributable to a specific function is being properly measured, a two-step process is used. First, a baseline (i.e., usually a without-project condition) is defined and the benefits associated with that baseline are estimated. Second, to determine the net benefits associated with the specific alternative being analyzed, the benefits associated with the baseline are deducted from the benefits estimated for the alternative. In the situation at hand, power benefits with, and without the CVP, will be determined using the PLEXOS model.

Current Status

The CVP Cost Allocation Technical Team continues to look for streamlining methods in conducting this study. In addition, Reclamation has conducted a number of workshops with stakeholders in order to solicit feedback to proposed methodologies and make changes, as appropriate. We heard the following suggestions from CVP preference power customer representatives at the February 16, 2013 meeting: (1) CVP power benefits should be valued through a direct application of market rates to CVP power accomplishments; and (2) If the PLEXOS model is used to provide a forecast of market rates, then another industry forecast, such as the proprietary forecast produced by Ventyx, should be used to assure that results generated from the PLEXOS forecast are reasonable. Initially, the second suggestion was to use the proprietary forecast in lieu of using the PLEXOS model; however, Reclamation staff explained that the PLEXOS model is needed to simulate CVP power accomplishments on an hourly basis because the CALSIM model can only provide generation estimates on a monthly timestep. The Technical Team has considered both suggestions. While the first suggestion seems reasonable, the second suggestion might result in Reclamation paying twice for similar models. Given our existing contract with Pinnacle and the need for PLEXOS to estimate CVP power accomplishments, power benefits will be evaluated using the PLEXOS model. We can, however, invite those

preference power customers who do subscribe to the Ventyx forecast to do their own comparison.

In consideration of these customer comments and our internal streamlining objective, the Technical Team is recommending a streamlined approach, which entails estimating the benefits of CVP hydropower through a direct calculation of power accomplishments multiplied by forecasted market prices. The power accomplishments would be based on data from a simulated water operations study of the state and Federal water projects using the CALSIM model. The traditional with and without approach outlined above entails significant data modeling requirements as well as time commitments given the effort associated with developing and undertaking both runs. The recommended simplifying methodology is to simply use a forecast of market prices, for year 2020 conditions when the RPS mandate will have been implemented and the Cap and Trade market will be mature and apply these prices, as appropriate, to forecasted CVP generation and ancillary services as constrained by the CVP's physical and regulatory operating constraints.

A primary reason for the Technical Team's recommendation for this streamlining approach is that the value of CVP power benefits under both the Alternative Cost and Market Price approaches is likely to be similar. Specifically, given that the size of the California market by 2020 is projected to be approximately 70,000 megawatts (MW) and that CVP capacity is 2,100 MWs or 3 percent of the overall market, when running a with and without analysis, it is likely that the difference in power market prices between the two runs will not be significant. Traditionally, an important reason for doing with and without analyses is the premise that market prices will be different with the hydro project in place as compared to a without project condition. However, for a large power system where the hydro resource represents only a small percentage of the market, market prices are assumed to be fairly similar for both the with and without project conditions.

In order to be reasonably assured that the streamlined approach results in a credible estimate of CVP power benefits, the Technical Team recommends that, prior to its full implementation, the approach be validated by undertaking a proof of concept test. This test would consist of performing cursory with and without project PLEXOS studies to confirm that market prices are likely to be fairly similar under both conditions. Assuming that the proof of concept test confirms no significant difference in power prices with CVP, the team recommends that the full analysis should continue using the methodology described below. If the with and without CVP PLEXOS runs result in different prices then the "with vs. without" CVP analysis will be performed.

- Run the PLEXOS model for a year 2020 market condition with the CVP hydro features in place.
- Estimate CVP energy benefits by a direct multiplication of generation accomplishments and market prices using forecasted energy and ancillary service market prices. The values would reflect year 2020 conditions, the intervening years between the zero point and 2020 could be interpolated while the post 2020 values could be projected based on the expected

increase in power prices, in real terms . In order to reflect the hydrologic range of projected future water deliveries, these could be calculated using probabilities so that expected values could be derived by applying probabilistic forecasts against the five water year types (e.g., dry, below normal, normal, above normal, and wet).

- Estimate the value of capacity considering a dry year condition either through the resource adequacy capacity market or by calculating the avoided cost of comparable thermal capacity that provides comparable benefits to CVP capacity.
- Invite any stakeholder with concerns regarding the validity of the market prices estimated using the PLEXOS model to compare those forecasted prices with the prices from another proprietary market price forecasting model to ensure that the results generated by the PLEXOS are reasonable and within the general range of expected values.

The following table presents the pros and cons of each option.

Power Benefit Analysis Comparison	
Pros	**Cons**
Option 1: Evaluate Power Benefits Using a With and Without Project Approach	
• Consistent with traditional methods for evaluating NED benefits. • Consistent with practice used historically for other Reclamation cost allocation studies. • Accurately estimates the net benefits associated with each alternative being analyzed. • Comparing the results with proprietary price forecasting tool will allow the result to be checked and normalized for reasonableness.	• The additional precision of using a with and without CVP approach may not be warranted given the relatively small size of CVP power production compared to the overall California electricity market. • Representatives of the preference power customers recommend a direct application of market prices to estimate power benefits.
Option 2: Evaluate Power Benefits Using a Simplified, Streamlined Market Price Approach	
• No significant difference in electricity market prices between the with and without CVP project cases is expected, making baseline comparisons unnecessary and duplicative. • Applying the streamlined approach makes the power benefit analysis easier and less complex to do. • The streamlined approach is more acceptable to CVP preference power customers. • Comparing the results with proprietary price forecasting tool will allow the result to be checked and normalized for reasonableness.	• Is inconsistent with practice used historically for other Reclamation cost allocation studies, because power rates are typically based on average costs rather than marginal costs.

Recommendation

The Leadership Team recommends testing the hypothesis that electricity market prices with and without the CVP are not significantly different. If that hypothesis can be validated, power benefits will be estimated using Option 2. Otherwise, the power benefits evaluation will be done using the Option 1 approach.

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